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THE CURRENT STATUS OF URBAN TRANSIT R & D IN CANADA

A REPORT PREPARED FOR THE URBAN TRANSIT RESEARCH AND DEVELOPMENT COORDINATION COMMITTEE

NOVEMBER, 1982

CANADIAN URBAN TRANSIT ASSOCIATION / L'ASSOCIATION CANADIENNE DU TRANSPORT URBAIN

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I - INTRODUCTION

In recognition that coordinated research and development is essential for the continued growth of the urban transit industry in Canada, the Canadian Urban Transit Association (CUTA) Board of Directors set up a Task Force in late 1981 to review the subject. The Task Force was asked to determine if the level of current activity in urban transit R & D is appropriate, to comment on the amount of existing coordination and if the answers to these two questions were in the negative, to recommend if there is an appropriate role for CUTA to play in rectifying the situation.

The Task Force submitted its report earlier this year. The main conclusions of the report are that there is insufficient coordination of urban transit R & D and there is no evidence that the R & D conducted is in answer to needs identified by the industry. The Task Force could not identify, in the short time available, the amount of funds allocated to urban transit R & D in Canada. The Task Force also reported that the apparent lack of coordination and direction could not be easily remedied by the existing agencies and that it was appropriate for CUTA to establish a Committee to address the identified problems. This Committee called the "Research and Development Coordination Committee" which is made up of government agencies and transit operator representatives from across Canada, was approved by CUTA's Board of Directors on March 1, 1982 and held its first meeting in late June. It agreed that there is in fact a need for improved coordination and that CUTA, through this Committee was the appropriate agency to address this matter.

As its first task, the Committee members agreed to initiate work aimed at getting a clearer picture of all the agencies involved in urban transit R & D, their type and level of activity, funding sources etc. The objective of this investigation was to produce a report which will give a nation wide description of the current situation. This report represents the results of this investigation. It is hoped that this document will allow the Committee to more effectively plan its future activities.

II - SURVEY METHODOLOGY

As agreed at the meeting of the Committee in Saskatoon on June 28, the task of collecting the required information was handled on a regional basis with the following assignments:

Atlantic Provinces:	L.R. Keddy Assistant Director, Transportation Nova Scotia Department of Municipal Affairs
Province of Québec:	Pierre Bouvier Directeur de la planification C.T.C.U.Q.
Province of Ontario:	Ian Campbell Executive Director, Transportation Technology and Energy Ontario Ministry of Transportation & Communications

Province of Manitoba:	R.L. Borland Director of Transit City of Winnipeg
Provinces of Saskatchewan and Alberta:	S. Quiring Manager, Program Development Alberta Transportation
Province of British Columbia:	L. Ward Assistant General Manager Lower Mainland B.C. Transit
Government of Canada:	L. Suen Senior Special Advisor Program Development Branch Transport Canada

While a standardized reporting format was recommended, each regional correspondent exercized his/her own judgement with respect to the appropriate method for gathering the required information. As a result, a number of methods of data collection were used by the regional correspondents including written requests, telephone requests and formal questionnaires.

III - AGENCIES CONTACTED

A wide variety of agencies were contacted including Federal and Provincial Departments, Crown Corporations, Municipal/Regional Governments, Transit Operators, Private Companies, Universities, and Public and Private Research Organizations involved in the collection and dissemination of urban transit R & D. A complete list of the agencies contacted by the various regional correspondents is provided in Appendix I.

A total of 133 agencies were contacted and as of November 1, 1982, a total of 98 responses had been received. Of these 98 respondents, 55 indicated they were carrying out research and development activities in Canada. The vast majority of the respondents who did not respond or who responded negatively were small and medium sized transit operators in the Province of Ontario as the Ontario correspondent contacted all CUTA operating members regardless of size.

A number of key organizations which are known to be involved extensively in urban transit R & D had not responded as of November 1 (eg. General Motors of Canada, University of Toronto/York University Joint Program in Transportation). However, it was necessary to proceed with the preparation of this report without data from these agencies due to time constraints.

IV - ANALYSIS OF DATA

In analyzing the information supplied by the regional correspondents a number of assumptions had to be made to ensure that the information contained in this report is consistent on a national basis. The following assumptions and definitions formed the basis of the information summarized in Tables 1 & 2.

These assumptions should be reviewed carefully prior to any examination of the statistics contained in these tables. As well, these assumptions should be kept in mind when conclusions are reached as to the present status of R & D in Canada.

Firstly, no assumptions were made by CUTA concerning whether or not the project fit the definition of research and development supplied by Transport Canada. With the exception of the projects specifically excluded by the following definitions all information supplied by the regional correspondents was included in the results.

Similarly, no assumptions were made by CUTA concerning whether or not the project had been assigned to the appropriate research category.

More specific assumptions concerning the information contained in Tables 1 & 2 are provided below:

Name of Agency:

Refers to the agency/company having charge, management or control over the research activity. Where two regional correspondents contacted the same agency, the duplication was eliminated.

Primary Type of Research: (1) refers to the primary research activity for that particular agency. The following research categories were identified:

Category A - Technology Development
Category B - Service and Methods Demonstration
Category C - Transportation Planning and Management
Category D - Policy Development and Research
Category E - Other Types of Research

(1) Some judgement was required as to the assignment of a specific research category to a particular agency. The Assignment of a specific research category was arbitrary and should viewed as a guide only. In some instances, agencies have been assigned to more than one research category.

Number of Projects Completed and/or Underway: (2) refers to the number of projects completed or initiated in the 1981-82 calendar or fiscal year. This time period was chosen due to the variety of reporting periods and the fact that projects rarely begin or end in any one fiscal or calendar year. It was felt that excluding those projects initiated during or prior to 1981-82 but not yet completed would not provide a true picture of R & D activities in the area of urban transit at the present time. With the above in mind, the following guidelines were used to evaluate the eligibility of specific projects for inclusion in Tables 1 & 2.

The following projects were excluded:

i) Projects initiated and completed in 1980.

ii) Projects to be initated in 1983 or beyond.

The following projects were included:

i) Projects initiated in 1980 and completed in 1981, 1982 or beyond.

ii) Projects initiated and completed in 1981 or 1982.

iii) Projects initiated in 1981 or 1982 and not completed until 1983 or beyond.

Number of Research Personnel: (2) refers to the number of research personnel directly involved in the management, administration or actual execution of the research activity. The number of research personnel identified in Table 1 is significantly underestimated for a variety of agencies as many did not report the number of internal staff persons involved in research activities partially conducted by external organizations or done completely by their own staff.

Number of Man Days: (2) refers to the total number of working days devoted to a particular research activity (paid or volunteer work). The following conversion factors were used when converting man hours, man months and man years to man days:

8 man hours = 1 man day
1 man week = 5 man days
1 man month = 21 man days
1 man year = 252 man days

(2) In some cases (predominently in Ontario) double or triple reporting occurs depending on the number agencies involved in a project. For example, if a project is undertaken by industry, for a transit system and funded by a provincial government, the project has been reported by all three agencies. No attempt was made to eliminate this duplication therefore the number of projects, research personnel, man days, total project budget, total research budget for R & D in Canada is inflated by approximately 20%.

The number of man days for Projects initiated or completed by Calgary Transit, Edmonton Transit and the City of Edmonton Transportation Management Department have been estimated by dividing the total project cost by $140 per man day to calculate a rough estimate of the man days involved in the research projects identified. Obviously, this method of calculation can seriously overestimate the number of man days where equipment was included as part of the project cost.

Total Project Budget (2) refers to the entire cost of completing the research activity regardless of the timing of the expenditure i.e. the total cost of completing the project not the funds expended in any one time period. It should be noted that, in some instances, it was difficult to determine if project or annual costs had been reported. As well, it is apparent that some respondents did not include the cost of internal staff time. This was especially true of government agencies and transit operators. In addition, a number of agencies supplied R & D information on the condition that research costs not be published. In all cases, the wishes of the respondents have been respected.

Total Research Budget (2) refers to the funds expended for R & D for a specified time period. For each agency identified in Table 1 (where possible) the time period in which the funds are spent is indicated by a footnote. Due to the nature of the information reported, it was necessary to make occasional assumptions concerning to the Total Research Budget and the timing of the expenditures.

V - SURVEY RESULTS

As shown in Table 1, 169 projects were completed and/or underway in 1981-82 involving 341 research personnel. The total budget for completing these projects was over $58.6 M with over $22.2 M allocated for 1981-82. The vast majority of projects were initiated by private companies, transit operators or provincial agencies.

In terms of the type of urban transit R & D being performed in Canada, the majority of current projects fall into the Technology Development category as shown in Table 2. More specifically, Bus and Paratransit Vehicle Technology and News Systems and Automation are the most popular areas of research.

Please refer to Appendix II for complete descriptions of the projects summarized in Tables 1 & 2.

TABLE 1

URBAN TRANSIT R & D (BY AGENCY)

NAME OF AGENCY	PRIMARY TYPE OF RESEARCH	NUMBER OF PROJECTS COMPLETED AND/OR UNDERWAY	NUMBER OF RESEARCH PERSONNEL	NUMBER OF MAN DAYS	TOTAL PROJECT BUDGET	TOTAL RESEARCH BUDGET (1981-82)	PRIMARY FUNDING SOURCE
I FEDERAL GOVERNMENT							
1. Transport Canada - Transport Development Centre	A, C	17	NA	NA	$3,926,884	$449,257 (1)	Federal Government
2. Department of Industry, Trade and Commerce	A	1	NA	NA	NA	NA	Federal Government
3. National Research Council	A	4	NA	NA	$985,000	$209,000 (1)	Federal Government
4. Transport Canada-Surface Transportation	B, C	4	NA	NA	$323,400	$177,900 (1)	Federal Government
SUB TOTAL	A	26	-	-	$5,235,284	$836,157	NA
II PROVINCIAL GOVERNMENTS							
5. BC Transit (5)	A	5	NA	386	$47,000	$47,000 (2)	BC Government
6. Ontario Ministry of Transportation and Communications (MTC)	A, B	16	8	2,900	$7,872,000	$3,650,000	Ontario Government
7. Manitoba Department of Highways, Transportation Division	B	2	1	NA	NA	$240,000 (1)	Manitoba Government
8. Québec Ministry of Transport	A, B	NA	NA	NA	NA	$250,000	Government of Québec
9. Québec Ministry of Industry and Commerce	A, B	NA	NA	NA	NA	NA	Government of Québec

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NAME OF AGENCY	PRIMARY TYPE OF RESEARCH	NUMBER OF PROJECTS COMPLETED AND/OR UNDERWAY	NUMBER OF RESEARCH PERSONNEL	NUMBER OF MAN DAYS	TOTAL PROJECT BUDGET	TOTAL RESEARCH BUDGET (1981-82)	PRIMARY FUNDING SOURCE
II PROVINCIAL GOVERNMENTS (cont'd)							
Conseil des transports de la région de Montréal (COTREM)	C	See Transit Operators (CTCUM & CTCUQ)					
Bureau de transport Métropolitain (BTM)	C						
10. Rehab Engineering, Health Science Centre	A	9	NA	60	NA	$6,000 (1)	Province of Manitoba
SUB TOTAL	A, B	32	9	3,346	$7,919,000	$4,193,000	NA
III CROWN CORPORATIONS							
11. Urban Transportation Development Corporation	A	6	30	7,500	$16,510,000	$6,200,000	Various
SUB TOTAL	A	6	30	7,500	$16,510,000	$6,200,000	NA
IV MUNICIPAL/REGIONAL GOVERNMENTS							
12. Greater Vancouver Regional Dictrict	A	1	NA	NA	NA	NA	BC Transit
13. City of Edmonton, Transportation Management Department	D	1	3	173	$26,700	$15,500 (3)	City of Edmonton

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IV MUNICIPAL REGIONAL GOVERNMENTS (cont'd)							
14. City of Moncton/Codiac Transit	C	1	NA	NA	$3,000	$3,000 (3)	City of Winnipeg
15. City of Winnipeg, Transportation Planning Section	C	1	NA	10	$1,800	$1,800	City of Winnipeg
SUB TOTAL	C	4	3	183	$31,500	$20,300	NA
V TRANSIT OPERATORS							
16. Edmonton Transit	A, B	8	NA	1,536	$215,000	$48,000 (3)	Alberta Transportation
17. Calgary Transit/City of Calgary Transportation Dept.	C	19	NA	12,159	$1,701,700	$631,400 (3)	Alberta Transportation/ City of Calgary
18. Metro Transit Commission (Halifax)/City of Halifax	A	1	NA	NA	$27,000	$27,000 (3)	Nova Scotia Dept. of Municipal Affairs/ Metro Transit Commission
19. Toronto Transit Commission	A, B	13	NA	NA	$11,837,000	NA	Ontario Ministry of Transportation and Communications
20. Kitchener Transit	C, D	3	10	600	$35,000	$25,000	Kitchener Transit

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V TRANSIT OPERATORS (cont'd)							
21. Hamilton Street Railway	C	1	3	150	$200,000	NA	Hamilton Street Railway
22. OC Transpo	A	12	6	300	$8,154,000	NA	Ontario Ministry of Transportation and Communications
23. Commission de transport de la Communauté urbaine de Montréal							
24. Commission de transport de la Communauté urbaine de Québec	A, B, C	NA	106	NA	NA	$4,600,000	Various
25. BTM (From Provincial Government)							
26. COTREM (From Provincial Gov't)							
SUB TOTAL	A, B, C	57	125	14,745	$22,169,700	$5,331,400	NA
VI PRIVATE COMPANIES							
27. Pacific Coach Lines	A	1	NA	NA	$30,000	NA	Transport Development Centre
28. Pachena Scientific Industrial Electronics Inc.	A	2	NA	2,897	$255,000	NA	National Research Council/Dept. of Industry, Trade and Commerce

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URBAN TRANSIT R & D (BY AGENCY)

NAME OF AGENCY	PRIMARY TYPE OF RESEARCH	NUMBER OF PROJECTS COMPLETED AND/OR UNDERWAY	NUMBER OF RESEARCH PERSONNEL	NUMBER OF MAN DAYS	TOTAL PROJECT BUDGET	TOTAL RESEARCH BUDGET (1981-82)	PRIMARY FUNDING SOURCE
VI PRIVATE COMPANIES (cont'd)							
29. Manop Industries Ltd.	C	1	NA	63	$15,000	$15,000 (2)	Transport Development Centre
30. Sel Canada	A	5	30	6,500	$1,200,000	$1,200,000	Sel Canada/Federal Government
31. Ontario Bus Industries	A	1	NA	4,000	$1,800,000	NA	Federal Government
32. Teleride Corporation	A	10	10	2,000	$3,200,000	$1,000,000	Ontario Ministry of Transportation and Communications
33. Washtronics Ltd.	A	6	5	NA	NA	$375,000 (1)	Washtronics Ltd.
34. Flyer Industries Ltd.	A	5	9	NA	NA	NA	Flyer Industries Ltd.
35. Shellar Globe Corp.	A	2	1	NA	NA	$40,000 (1)	Shellar Globe Corp Ltd
36. BBC Brown Boveri, TRM Industries 37. BG Checo International Ltd. 38. Bombardier Limitée 39. G.S.M. Taxi Ltd.	A	NA	68	NA	NA	$2,000,000	Individual Company/ Ministry of Transport (Québec)
SUB TOTAL	A	33	123	15,460	$6,500,000	$4,630,000	NA

TABLE 1

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VII UNIVERSITY/COLLEGE							
40. University of British Columbia	C	5	5	755	$90,000	NA	University of B.C.
41. Canadian Institute of Guided Ground Transport (Queens University)	A	2	9	50	$152,000	NA	Various
42. University of Manitoba, Centre for Transportation Stuides	C	4	NA	800	NA	$7,050 (1)	University of Manitoba
43. L'École Polytechnique	C	NA	5	NA	NA	NA	NA
44. Centre de Recherche sur les transports de l'Université de Montréal	C	NA	32	NA	NA	$1,000,000	Various
SUB TOTAL	C	11	51	1,605	$242,000	$1,007,050	NA

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NAME OF AGENCY	PRIMARY TYPE OF RESEARCH	NUMBER OF PROJECTS COMPLETED AND/OR UNDERWAY	NUMBER OF RESEARCH PERSONNEL	NUMBER OF MAN DAYS	TOTAL PROJECT BUDGET	TOTAL RESEARCH BUDGET (1981-82)	PRIMARY FUNDING SOURCE
SUMMARY - ALL AGENCIES							
Federal Government	A	26	-	-	$5,235,284	$836,157	NA
Provincial Governments	A, B	32	9	3,346	$7,919,000	$4,193,000	NA
Crown Corporations	A	6	30	7,500	$16,510,000	$6,200,000	NA
Municipal/Regional Governments	C	4	3	183	$31,500	$20,300	NA
Transit Operators	A, B, C	57	125	14,745	$22,169,700	$5,331,400	NA
Private Companies	A	33	123	15,460	$6,500,000	$4,630,000	NA
University/College	C	11	51	1,605	$242,000	$1,007,050	NA
TOTAL	NA	169	341	42,839	$58,607,484	$22,217,907	NA

Footnotes

(1) 1981-82 Fiscal Year
(2) 1982-83 Fiscal Year
(3) 1982 Calendar Year
(4) Represents research budget for projects directly applicable to urban transit. Excludes research on InterCity Transportation

TABLE 2
URBAN TRANSIT RESEARCH & DEVELOPMENT IN CANADA

(BY TOPIC) SECTION A	PROJECTS COMPLETED AND/OR UNDERWAY (*)
TECHNOLOGY DEVELOPMENT	
1. Bus and Paratransit Vehicle Technology	42
2. Bus and Paratransit Operational Technology	10
3. Rail and Construction Technology	9
4. New Systems and Automation	25
5. New Systems Application	12
6. Safety and Product Qualification	3
7. Socio Economic Research and Special Projects	1
SUB TOTAL	102
SECTION B	
SERVICE AND METHODS DEMONSTRATION	
1. Transportation Services for Special User Groups	4
2. Fare and Pricing Policy	6
3. Conventional Transit Service Innovations	8
4. Paratransit	3
SUB TOTAL	21
SECTION C	
TRANSPORTATION PLANNING AND MANAGEMENT	
1. Planning Methods and Support	12
2. Special Planning Studies	20
3. Transportation Management	9
SUB TOTAL	41
SECTION D	
POLICY DEVELOPMENT AND RESEARCH	
1. Policy and Program Development	2
2. Training Programs	1
SUB TOTAL	3
SECTION E	
1. Other types of R & D Projects	2
SUB TOTAL	2
TOTAL	169

(*) Does not include projects initiated or completed by Government Agencies, Transit Operators, Private Companies or Universities based in the Province of Québec (see Appendix I for list of Agencies contacted)

VI - INITIATION OF URBAN TRANSIT R & D

Overall, from a national perspective, the initiation of urban transit research and development varied considerably depending on the agency involved. Generally, most projects initiated by transit operators are internally generated in response to operational problems although in Ontario, a number of projects have been initiated jointly by the operator and the Province in response to long term technological concerns.

Projects initiated by the Federal Government are aimed at managing the application of science and technology towards a more efficient national transportation system. Research in these areas is limited to projects which are identified as being innovative, high risk, long range and national (or international) in scope. Unsolicited proposals from industry, academia, and private associations often result in the initiation of federal R & D although in-house initiation of projects and R & D needs identified in other federal projects often result in project initiation.

Provincial governments tend to initiate R & D which will improve the technological capability and consequently the operational efficiency of transit systems. This is usually in response to technological and operational problems identified by operators and manufacturers. In Alberta for instance, an annual grant is provided to municipalities for R & D activities in transportation (not just transit). Project initiation and priorities for R & D are determined by the various municipalities and referred to the Province for consideration. Calgary and Edmonton have internal systems for identifying and priorizing the R & D of the various city departments. In most other provinces, projects are initiated jointly by the province and the transit operator or private company. The cost and management of the project is then shared by the participating agencies.

Private Companies, as expected, tend to initiate R & D in response to present demand requirements, anticipated market trends and the need for internal product improvement. The involvement of universities in urban transit R & D is usually limited to the availability of research dollars in a specific area of interest to the researchers.

VII - COORDINATION OF URBAN TRANSIT R & D

While funding agencies obviously coordinate the research and development within their respective jurisdictions, on a national basis, little coordination is evident. There appears to duplication of effort in a number of areas particularly in the areas of communication and information systems, fare structures and fare collection, transit priorities, introduction and operation of articulated buses, vehicles for the disabled, and modeling, performance indicators and socio-economic research. While a number of these activities require location specific R & D, many projects appear to be unnecessarily duplicated. This can be directly attributed to the fact that no national organization has accepted responsibility for coordinating R & D in the area of urban transit. Similarily, the lack of a national organization responsible for priorizing the R & D conducted by the various agencies currently carrying out R & D activities in Canada is evident. Most projects are initiated internally on an ad hoc basis. The overall direction of the industry is rarely taken into account when R & D priorities are established by individual agencies.

VIII - DISSEMINATION OF INFORMATION

Clearly, the area which has been most seriously affected by the lack of national coordination of R & D is the dissemination of project results. For the vast majority of agencies contacted, a specified number of reports are usually published by the agency conducting the project. The availability and distribution of the these reports is almost always limited to those agencies directly affected or directly involved in the project. While many agencies advise Libraries of the reports availability no national organization has taken charge of collecting and disseminating information on behalf of the entire industry. Although CUTA has made a serious attempt in the past several years to upgrade its collection of technical reports, studies etc. this effort, while successful, is not adequate due to insufficient staff time and resources.

IX - CONCLUSIONS

In conclusion, despite significant R & D activity in the area of urban transit little coordination appears to exist on a national basis. This has resulted in duplication of effort and an unnecessary apparent waste of scarce R & D funds. In addition R & D is initiated on an ad hoc basis with little regard for the overall needs and priorities of the urban transit industry. The dissemination of project results is poor and has seriously undermined the overall effectiveness of current R & D efforts.

APPENDIX I

AGENCIES CONTACTED

RESPONSES RECEIVED

The following list details the agencies contacted by each regional representative, whether or not the agency is carrying out R & D and whether or not documentation on the projects completed and/or underway is enclosed in Appendix II.

AGNECIES CONTACTED	CARRYING OUT R & D IN CANADA	PROJECT DESCRIPTION ENCLOSED
ALBERTA AND SASKATCHEWAN		
1. Calgary Transit/City of Calgary Transportation Dept.	Yes	Yes
2. University of Calgary	Yes	No
3. Edmonton Transit	Yes	No
4. City of Edmonton - Transportation Management Dept.	Yes	No
5. University of Alberta	Yes	No
6. Alberta Research Council	No	No
7. Alberta Transportation	No	No
8. Saskatchewan Department of Urban Affairs	No	No
9. Saskatchewan Department of Highways and Transportation	No	No
10. University of Saskatchewan	Yes	No
BRITISH COLUMBIA		
1. BC Transit	Yes	Yes
2. Greater Vancouver Regional District	Yes	Yes
3. MTOC - Vancouver	Yes	Yes
4. Pacific Coach Lines	Yes	Yes
5. SHM Marine International	Yes	Yes
6. Bob Leighton & Associates Ltd.	Yes	Yes
7. Hickling Partners	Yes	Yes
8. Hovey & Associates Ltd.	Yes	Yes
9. GSM Design Consultants	Yes	Yes
10. Dr. R.F. Webb Corp. Ltd.	Yes	Yes
11. MANOP Industries Ltd.	Yes	Yes
12. University of British Columbia	Yes	Yes
13. Pachena Scientific Industrial Electronics Inc.	Yes	Yes
MANITOBA		
1. Washtronics Ltd.	Yes	No
2. City of Winnipeg, Transportation Planning Section	Yes	No
3. Rehab Engineering, Health Science Centre	Yes	No
4. Flyer Industries Ltd.	Yes	No
5. Manitoba Dept. of Highways, Transportation Division	Yes	No

AGENCIES CONTACTED	CARRYING OUT R & D IN CANADA	PROJECT DESCRIPTION ENCLOSED
MANITOBA (continued)		
6. Shellar Globe Corp. Ltd.	Yes	Yes
7. University of Manitoba, Centre for Transportation Studies	Yes	No
MARITIMES PROVINCES		
1. Fredericton Transit	No	No
2. Codiac Transit/City of Moncton	Yes	No
3. Saint John Transit	No	No
4. St. John's Transportation Commission	No	No
5. Metro Transit Commission (Halifax)	Yes	No
6. Nova Scotia Department of Municipal Affairs	No	No
ONTARIO		
1. Barrie Transit	No	No
2. Belleville Transit	No	No
3. Brampton Transit	No	No
4. Brantford Transit	No	No
5. Burlington Transit	No	No
6. Cambridge Transit	No	No
7. AECL Ltd. (Chalk River)	No	No
8. City of Chatham	No	No
9. Cornwall Transit	No Response	
10. Guelph Transportation Commission	No Response	
11. Hamilton Street Railway	Yes	Yes
12. Quesnel Bus Line Ltd. (Hawkesbury)	No	No
13. Kingston Transit	No	No
14. Kingston Township Transit	No	No
15. Kitchener Transit	Yes	Yes
16. London Transit Commission	No Response	
17. Midland Transit	No Response	
18. Mississauga Transit	No	No
19. Newmarket Transit	No Response	
20. Niagara Transit	No	No
21. North Bay Transit	No	No
22. Oakville Transit	No	No
23. Oshawa Transit	No	No
24. OC Transpo	Yes	Yes
25. M & O Bus Lines Ltd. (Ottawa)	No Response	
26. City of Owen Sound	No Response	

AGENCIES CONTACTED	CARRYING OUT R & D IN CANADA	PROJECT DESCRIPTION ENCLOSED
ONTARIO (continued)		
27. Pembroke Transit	No	No
28. City of Peterborough	No	No
29. Pickering Transit	No Response	
30. D.J. Travel Transit Ltd. (Port Hope)	No Response	
31. Richmond Hill Transit	No Response	
32. St. Catharines Transit Commission	No Response	
33. Sarnia Transit	No	No
34. Sault Ste. Marie Transportation Commission	No	No
35. Stratford Transit	No	No
36. Sudbury Transit	No Response	
37. Thunber Bay Transit	No Response	
38. Timmins Transit	No	No
39. GO Transit (TATOA)	No Response	
40. Toronto Transit Commission	Yes	Yes
41. Welland Transit	No Response	
42. Transit Windsor	No Response	
43. Woodstock Transit	No	No
44. Abex Industries Ltd.	No	No
45. Ancaster Aluminum Projects Ltd.	No Response	
46. Baker Manufacturing Ltd.	No	No
47. Bayly Engineering Ltd.	No	No
48. Beclawat Ltd.	No Response	
49. Bendix HVS Inc.	No Response	
50. CGE Company Ltd.	No Response	
51. Canadian Ohio Brass Co. Ltd.	No	No
52. Chemco Rubber Ltd.	No Response	
53. Cummins Diesel of Canada Ltd.	No Response	
54. Daytech Mfg. Ltd.	No	No
55. Dofasco Inc.	No Response	
56. Ford Smith Machine Co. Ltd.	No	No
57. Forster Instruments Ltd.	No	No
58. Funcraft Vehicles Ltd.	No Response	
59. Garrett Manufacturing Ltd.	No Response	
60. Gasboy of Canada Ltd.	No	No
61. General Motors of Canada Ltd.	No Response	
62. Goodyear Canada Inc.	No	No
63. Gulf Canada Ltd.	No Response	
64. Harper Detroit Diesel Ltd.	No	No
65. Hawker Siddeley Canada Inc.	Yes	No
66. Kysor of Cadillac	No Response	
67. Multilite Transit Products	No	No
68. Ontario Bus Industries	Yes	Yes
69. Sel Canada Ltd.	Yes	Yes
70. Shell Canada Ltd.	No Response	
71. Stemco Canada Ltd.	No	No
72. Stone Platt Electrical Ltd.	No Response	
73. Telerider Developments Ltd.	Yes	Yes
74. Wabco Ltd.	No Response	

AGENCIES CONTACTED	CARRYING OUT R & D IN CANADA	PROJECT DESCRIPTION ENCLOSED
ONTARIO (continued)		
75. Westcode Ltd.	No Response	
76. Sage Management Consultants	No Response	
77. Canadian Institute of Guided Ground Transport (Queens University)	Yes	Yes
78. University of Toronto/York University Joint Program in Transportation	No Response	
79. Ontario Ministry of Transportation and Communications	Yes	Yes
80. Urban Transportation Development Corporation	Yes	Yes
QUÉBEC		
1. Québec Ministry of Transport	Yes	No
2. Québec Ministry of Industry and Commerce	Yes	No
3. Conseil des transports de la région de Montréal (COTREM)	Yes	No
4. Bureau de transport Métropolitain (B.T.M.)	Yes	No
5. Commission de transport de la Communauté urbaine de Montréal (CTCUM)	Yes	No
6. Commission de transport de la Communauté urbaine de Québec (CTCUQ)	Yes	No
7. BBC Brown Boveri, TRM Industries	Yes	No
8. BG Checo International Ltd.	Yes	No
9. Bombardier Limitée	Yes	No
10. G.S.M. Taxi Ltd.	Yes	No
11. L'École Polytechnique	Yes	No
12. Centre de recherche sur les transports de l'Université de Montréal	Yes	No
FEDERAL GOVERNMENT		
1. National Research Council	Yes	Yes
2. Department of Industry, Trade and Commerce	Yes	No
3. Transport Canada-Surface Transportation	Yes	Yes
4. Transport Canada-Transportation Development Centre	Yes	Yes
5. Department of Communications	No Response	

APPENDIX II

DESCRIPTIONS OF PROJECTS

COMPLETED AND/OR UNDERWAY

(as submitted to the Regional Correspondents)

Note: The projects listed in this Appendix include a small number which have been excluded from Tables 1 & 2 due to the various assumptions which were made. This Appendix is provided for information purposes only.

CITY OF CALGARY TRANSPORTATION DEPARTMENT

TRANSIT RESEARCH AND DEVELOPMENT PROJECTS

Title: "Combination Survey to Determine Attitude and Awareness of Calgary Transit Services and Optimum Target Market for Increasing Ridership"

Objectives: Determine:

- Awareness and attitude toward transit services;
- Market segments to tap for increased ridership;
- Areas of future research;
- Need for Transit Information Handbook.

Estimated Costs: $30,000

Completion Date: 1983

Project Report: Not yet available.

Title: "South LRT Impact Study

Objectives: A comprehensive analysis of the impact of LRT on all aspects of transportation in the corridor including the road network, transit network, personal travel patterns, urban development, finance, safety, noise and vibration.

Estimated Costs: $260,000

Completion Date: 1983

Project Report: Available in 1983.

Title: Automated Vehicle Monitoring (AVM) System

Objectives: To establish an AVM system for a portion of the Calgary Transit bus and LRV fleet and, if possible, to share this system with other City Departments.

Estimated Cost: $275,000 (1983 only)

Completion Date: Undetermined

Project Report: Not Available.

Title: "Traffic Characteristics of Larger Suburban Offices"

Objectives: To determine:

- mode split
- trip generation
- parking demand and accumulation
- parking entrance/exit requirements

from large suburban offices.

Estimated Cost: $35,000

Completion Date: 1983

Project Report: Available in 1983

Title: "Fare Evasion of C-Train"

Objectives: To determine the extent of fare evasion occurring on the C-Train (LRT)

Estimated Cost: $22,000

Completion Date: 1983

Project Report: To be integrated with "South LRT Impact Study" and "Transit Fare System Study"

Title: "Transit Fare System Study"

Objectives: To determine:

- the effectiveness and equity of the existing fare system;
- the effectiveness of various fare system alternatives;
- the optimum fare system for Calgary.

Estimated Cost: $8500

Completiion Date: 1983

Project Report: Available in early 1983

Title:	"Calgary Transit Pilot Project - Early Implementation of Full Service"
Objectives:	To determine if the introduction of full transit service rather than peak hour service into a developing residential area at the initial stage could create an earlier and higher use of transit by the residents than is normally developed by the staging method.
Estimated Cost:	$310,000
Completion Date:	1983
Project Report:	Available in early 1983

Title:	"Simulation of LRT and Buses on the 7th Avenue Transit Mall"
Objectives:	To develop a total simulation model of LRT, bus and cross traffic on the 7th Avenue Transit Mall. This model would then be used as a planning tool in determining transit headways, signal timings, train lengths, bus stop locations, etc.
Estimated Cost:	$5,000
Completion Date:	1983
Project Report:	1983

Title:	"Optimum Bus Life/Optimum Fleet Availability
Objectives:	Develop formula from which the most cost-effective life of buses can be calculated. Determine the most cost-effective proportion of the transit fleet which should be available for service during peak periods of average weekdays.
Estimated Cost:	$30,000
Completion Date:	Uncertain
Project Report:	Tentatively "on hold"

Title:	"Computerized Transit Dispatch and Payroll System"
Objectives:	Develop an alternative dispatch and payroll system which will replace and expand the present labor intensive and error prone manual methods.
Estimated Cost:	$231,000
Completion Date:	1983
Project Report:	Expected in 1983

Title:	"Transportation Needs of the Elderly and Handicapped in Calgary"
Objectives:	To examine existing and future demand for mobility of the elderly and handicapped, and relate this demand to existing transportation services. To identify gaps in the satisfaction of mobility requirements of this segment of the population.
Estimated Cost:	$75,000
Completion Date:	1982
Project Report:	Now Available

Title:	"Farescan Farebox Study"
Objectives:	To determine their effectiveness in handling paper money.
Estimated Cost:	$500
Completion Date:	1982
Project Report:	Available in late 1982

Title:	"Upgrading Transit Ridership Information"
Objectives:	To upgrade transit ridership information in terms of increasing the quantity of data collected, improving the reliability and consistency of the data, and producing essential information reports through the implementation of a comprehensive automatic bus passenger counting system.
Estimated Cost:	$81,000 (not including "system-wide" implementation)
Completion Date:	(of Demonstration Project) 1983
Project Report:	Available in 1983

Title:	Calgary Transportation Study (CALTS) Model Update"
Objectives:	Develop a detailed data base of travel patterns within Calgary in 1981. Develop new transportation modelling techniques which reflect 1981 travel behaviour (including modal split, etc.) Continue the research and development of transportation planning models.
Estimated Cost:	$605,000
Completion Date:	1983
Project Report:	Available in mid-1983

Title:	"Transit Trip Generation Study"
Objectives:	To determine up-to-date transit generation rates from various land-use types.
Estimated Cost:	$2,500
Completion Date:	1983
Project Report:	Available in 1983

Title:	"Bus-Only Lane Study"
Objectives:	To determine existing locations where Calgary Transit buses are experiencing excessive delays due to traffic congestion. To determine the feasibility of implementing either "contraflow" or "concurrent flow" exclusive bus lanes at these locations.
Estimated Cost:	$7500
Completion Date:	1983
Project Report:	Available in 1983

Title:	"Articulated Bus Demonstration Project"
Objectives:	To conduct an "in-service" evaluation of two articulated bus models (M.A.N. and Volvo). This evaluation included operating costs, maintenance costs, operating characteristics, reaction of transit drivers and patrons etc.
Estimated Cost:	Unavailable
Completion Date:	1981
Project Report:	Now Available

Title:	"Bus Stop Report"
Objectives:	To evaluate and make recommendations regarding bus stop location, design, signing, spacing etc. in the City of Calgary.
Estimated Cost:	$5000
Completion Date:	1982
Project Report:	Available in 1982 December

Title:	"University of Calgary/Mount Royal College Transit Study"
Objectives:	Through the use of detailed surveys, to determine usage and perception of existing Calgary Transit service by students/employees of these institutions, and to obtain information to assist in the planning of future transit facilities affecting these locations.
Estimated Cost:	$12,500
Completion Date:	1983
Project Report:	Available in early 1983

Title:	"Limited Stop Concept on Selected Mainline Routes"
Objectives:	To improve transit efficiency and effectivenss on selected mainline routes. Specifically, to balance transit passenger loadings and travel times through the creation of "inner" and "outer" routes during peak periods.
Estimated Cost:	Negligible (some potential savings in operating costs)
Completion Date:	Ongoing project.
Project Report:	Undetermined at this time.

Title:	"Performance Indicators Study"
Objectives:	To identify and evaluate alternative measures of Calgary Transit performance (both route-specific and system-wide).
Estimated Cost:	$1900
Completion Date:	Late 1982
Project Report:	Available in late 1982

Title:	"Electronic Destination Sign Study"
Objectives:	To evaluate the suitability and cost-effectiveness of electronic destination signs for Calgary Transit buses.
Estimated Cost:	$28,250
Completion Date:	1982
Project Report:	Available late 1982

Title:	"General Hospital Transit Study"
Objectives:	Through the use of a detailed survey, to determine usage and perception of existing Calgary Transit service by patients/employees of the General Hospital, and to obtain information to assist in the planning of future transit facilities affecting this institution.
Estimated Cost:	$5000
Completion Date:	1982
Project Report:	Available in late 1982

Title:	"Evaluation of C-Train Fare System"
Objectives:	To determine the public's perception of the C-Train fare system and the problems resulting from this perception.
Estimated Cost:	$19,000
Completion Date:	1983
Project Report:	Available in 1983

AGENCY (IES): BC TRANSIT

PROJECT: Custom Vehicle for the Handicapped

CATEGORY: A1

DESCRIPTION: Development of a Vehicle with lift and tie-down for transportation of the handicapped.

INITIATING PARTY: BC Transit

DATE INITIATED: September 1981

CURRENT STATUS: Completed. System already in use.

ESTIMATED COMPLETION DATE: Completed December 1981

ESTIMATED COST: In-house research

FUNDING SOURCE (S): BC Transit

ESTIMATED MAN-DAYS INVOLVED: N/A

PLANNED PUBLICATION OF RESULTS: System for use in Paratransit and Custom Transit operations in and outside B.C.

AGENCY (IES): BC TRANSIT

PROJECT: Paratransit Computerized Performance Monitoring

CATEGORY: A4

DESCRIPTION: A project aimed at developing a monitoring system for measuring the performance of paratransit operations using computer technology.

INITIATING PARTY: BC Transit

DATE INITIATED: January 1982

CURRENT STATUS: Ongoing

ESTIMATED COMPLETION DATE: November 1982

ESTIMATED COST: $1-2,000

FUNDING SOURCE (S):BC Transit

ESTIMATED MAN-DAYS INVOLVED: 1 man-month (21 man days)

PLANNED PUBLICATION OF RESULTS: N/A

AGENCY (IES): BC TRANSIT

SHM MARINE INTERNATIONAL

PROJECT: SeaBus Hull Re-designing

CATEGORY: A5

DESCRIPTION: Investigating different kinds of hulls that will reduce wave action and damages resulting from it.

INITIATING PARTY: BC Transit

DATE INITIATED: February 1982

CURRENT STATUS: Almost complete

ESTIMATED COMPLETION DATE: October 1982

ESTIMATED COST: $45,000

FUNDING SOURCE (S): BC Transit

ESTIMATED MAN-DAYS INVOLVED: 900 Man-Hours (113 Man Days)

PLANNED PUBLICATION OF RESULTS: N/A

AGENCY (IES): BC TRANSIT

PROJECT: Tracking Maintenance Costs and characteristics of Fleet

CATEGORY: C1

DESCRIPTION: Program of analysis and review of maintenance procedure in use to provide budgetary information and controls, for use in small communities and paratransit systems.

INITIATING PARTY: BC Transit

DATE INITIATED: May 1982

CURRENT STATUS: Almost complete

ESTIMATED COMPLETION DATE: September 1982

ESTIMATED COST: In-house research

FUNDING SOURCE (S): BC Transit

ESTIMATED MAN-DAYS INVOLVED: 1 man-year (252 Man Days)

PLANNED PUBLICATION OF RESULTS: For use in B.C. systems

AGENCY (IES): BC TRANSIT
GVRD
MTOC

PROJECT: Transit Information System (T.I.S.) Study

CATEGORY: E1

DESCRIPTION: To develop a coordinated and comprehensive information system for transit agencies in the large urban areas of the Province.

INITIATING PARTY: BC Transit

DATE INITIATED: September 1981

CURRENT STATUS: Completed feasibility stage.
General specifications stage is underway.

ESTIMATED COMPLETION DATE:

Phased implentation beginning early 1983.

ESTIMATED COST: In-house research

FUNDING SOURCE (S): BC Transit
GVRD
MTOC

ESTIMATED MAN-DAYS INVOLVED: N/A

PLANNED PUBLICATION OF RESULTS: Intra-organisation

AGENCY (IES): GVRD

BC TRANSIT

PROJECT: Custom Transit - Telephone Device for the Deaf (TDD)

CATEGORY: A4

DESCRIPTION: A study to look into installation of a TDD in the GVRD office to permit users to communicate with GVRD staff who could then relay their request for service to the appropriate operator.

INITIATING PARTY: GVRD

DATE INITIATED: 1982/83 Fiscal Year

CURRENT STATUS: Ongoing

ESTIMATED COMPLETION DATE: 1983/84 Fiscal Year

ESTIMATED COST: In-house research

FUNDING SOURCE (S): BC Transit

ESTIMATED MAN-DAYS INVOLVED: N/A

PLANNED PUBLICATION OF RESULTS: For use in Greater Vancouver system

AGENCY (IES): UBC (Frank Navin - Civil Engineering)

PROJECT: Fare Structures and Increase in Deficits

CATEGORY: B2

DESCRIPTION: Investigate fare structure policies necessary in the context of increasing deficits.

INITIATING PARTY: UBC

DATE INITIATED: May 1982

CURRENT STATUS: Ongoing

ESTIMATED COMPLETION DATE: June 1983

ESTIMATED COST: N/A

FUNDING SOURCE (S): UBC

ESTIMATED MAN-DAYS INVOLVED: 6 man-months (125 Man Days)

PLANNED PUBLICATION OF RESULTS: General consumption

AGENCY (IES): UBC (Frank Navin - Civil Engineering)

PROJECT: Demand Forecasting Model

CATEGORY: C1

DESCRIPTION: Setting up demand equations for transit in Greater Vancouver

INITIATING PARTY: National Science and Engineering Council (Federal)

DATE INITIATED: June 1981

CURRENT STATUS: Ongoing

ESTIMATED COMPLETION DATE: 1983

ESTIMATED COST: N/A

FUNDING SOURCE (S): National Science and Engineering Council

UBC

ESTIMATED MAN-DAYS INVOLVED: 1-2 man months (42 Man Days)

PLANNED PUBLICATION OF RESULTS: General consumption

AGENCY (IES): UBC (Ken Denike, Geography)

PROJECT: Evaluating the Urban Transportation Model Package (Dept. of Transportation, Washington, D.C.)

CATEGORY: C1

DESCRIPTION: Develop a transportation model for use in B.C. systems by modifying or adapting UTPS to local conditions.

INITIATING PARTY: UBC

DATE INITIATED: July 1982

CURRENT STATUS: 1st phase almost complete - determine suitability of model to UBC's computer system

ESTIMATED COMPLETION DATE: Mid-1983

ESTIMATED COST: $80,000

FUNDING SOURCE (S): UBC

ESTIMATED MAN-DAYS INVOLVED: 2 man-years (504 man Days)

PLANNED PUBLICATION OF RESULTS: For use by BC municipalities

AGENCY (IES): UBC - (Gerry Brown - Civil Engineering)

PROJECT: Travel Mode Behavioural Modelling

CATEGORY: C2

DESCRIPTION: Travel mode choice in Vancouver

1. Comparison of 3 different methodologies
2. Develop system to complete data matrix

INITIATING PARTY: UBC

DATE INITIATED: September 1981

CURRENT STATUS: Research finished - 2 publications planned

ESTIMATED COMPLETION DATE: April 1982

ESTIMATED COST: $10,000

FUNDING SOURCE (S): National Science and Engineering Research Council (Federal)

ESTIMATED MAN-DAYS INVOLVED: 1 semester (84 man Days)

PLANNED PUBLICATION OF RESULTS: General consumption

AGENCY (IES): UBC (Gerry Brown - Civil Engineering)

City of Vancouver

PROJECT: Stocastic Assignment Model for Motor Vehicle and Transit Flows

CATEGORY: C2

DESCRIPTION: Assign transit or automobile flows to an urban site and develop a downtown parking model for Vancouver.

INITIATING PARTY: UBC

DATE INITIATED: 1975

CURRENT STATUS: First version complete and being modified

ESTIMATED COMPLETION DATE: Second version be be completed in 1982

ESTIMATED COST: N/A

FUNDING SOURCE (S): UBC

ESTIMATED MAN-DAYS INVOLVED: N/A

PLANNED PUBLICATION OF RESULTS: For urban sites

AGENCY (IES):
- PCL (Brian Clark)
- Hickling Partners
- Hovey & Associates
- GSM - Design Consultants
- Dr. R. F. Webb

PROJECT: The Double Decker Bus

CATEGORY: A1

DESCRIPTION: Determine need for the bus and review available systems

INITIATING PARTY: PCL

DATE INITIATED: November 1980

CURRENT STATUS: Completed

ESTIMATED COMPLETION DATE: March 1982

ESTIMATED COST: $30,000

FUNDING SOURCE (S): Transport Development Centre of Transport Canada

ESTIMATED MAN-DAYS INVOLVED: N/A

PLANNED PUBLICATION OF RESULTS: Report on Phase 1 available from Transport Canada, # TB3181, dated December 1981.

AGENCY (IES): PACHENA SCIENTIFIC

PROJECT: PACO - Passenger Counter

CATEGORY: A4

DESCRIPTION: Develop a low-cost automatic passenger counter

INITIATING PARTY: Pachena Scientific

DATE INITIATED: March 1982

CURRENT STATUS: Preliminary Stages

ESTIMATED COMPLETION DATE: Fall of '83

ESTIMATED COST: $55 - 55,000

FUNDING SOURCE (S): Pachena
National Research Council

ESTIMATED MAN-DAYS INVOLVED: 3.5 man-years (881 Man Days)

PLANNED PUBLICATION OF RESULTS: For Marketing

AGENCY (IES): PACHENA SCIENTIFIC

PROJECT: DAVID 300 - Digital Automatic Vehicle Information Display

CATEGORY: A4

DESCRIPTION: Electronic head sign for buses or any other information location

INITIATING PARTY: Pachena Scientific

DATE INITIATED: November 1980

CURRENT STATUS: Complete

ESTIMATED COMPLETION DATE: First demonstrated Fall of '81 - taken Chicago transit show:
Complete redesign September 1982.

ESTIMATED COST: $200,000

FUNDING SOURCE (S): Pachena

National Research Council

Federal Ministry Industry, Trade and Commerce

ESTIMATED MAN-DAYS INVOLVED:

8 man-years (2016 Man Days)

PLANNED PUBLICATION OF RESULTS:

For Marketing

AGENCY (IES): Manop Industries Ltd.

Transport Canada

PROJECT: Access Study for EXPO '86

CATEGORY: C2

DESCRIPTION: To develop an access plan for EXPO '86 including Park and Ride, a downtown shuttle service, connections between parking areas, i.e., a total access study for the whole Fraser Valley to EXPO '86.

INITIATING PARTY: Transport Canada

DATE INITIATED: May 1982

CURRENT STATUS: Ongoing

ESTIMATED COMPLETION DATE: October 1982

ESTIMATED COST: $15,000

FUNDING SOURCE (S): Transport Development Centre of Transport Canada

ESTIMATED MAN-DAYS INVOLVED: 3 man-months (63 man Days)

PLANNED PUBLICATION OF RESULTS: Not yet known.

Prepared by: TTC

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

ncy	Project Title	Objective	Contractor	Status - Dates Start	Finish	($000's) Est. Cost	Remarks
TC	Ridership factors model	To determine historical relationships between ridership and factors affecting ridership	Marc Gaudry	1980	1982	72	C1
	Computerized scheduling and dispatching of handicapped transit	Improve scheduling efficiency and service for Wheel-Trans customers	G.I.R.O.	1980	1983	650	B1
	Transit priority - pre-emptive signal testing	To test bus priority at exits from subway terminal		1981	1982	35	A2
	Development of route criteria for express buses	To determine appropriate route and service criteria for use of express buses		1982	1982	5	B3
	Articulated Light Rail Vehicle	Equipment test of UTDC's ALRV	U.T.D.C.	Fall 1982	1983	Nil	A1
	Timeline	To determine "Telerider" suitability and benefits to the TTC	Telerider Corp.	1981	1986	400	A4
	Variable Work Hours Program	To attempt to spread the peak hour demands on the transit system	Environics Research	1981	1983	230	B3

Prepared by: Kitchener Transit

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (UPDATED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
Kitchener Transit	Transportation Demand Characteristics	- overall perspective to transport needs of population particularly transit needs	In-house	Oct. 1980	1981	$15,000	- data collection, analysis and computer program preparation
"	Existing Transit Services	- determine existing operating characteristics of transit routes	In-house	1981	1983	$20,000	- data collected and analyzed over 2 years
"	Transit Service Policies	- develop policies with respect to service levels and priorities	In-house	1983	1984	N/A	- In-house
"	Transit Service Improvements	- based on above reports, recommend service proposals to better attain maximum route efficiency & effectiveness	In-house	1983	1984	N/A	- In-house
"	5 Year and 20 Year Transit Plan	- estimate future transit needs and expenditures	In-house	1983	1984	N/A	- In-house
"	Guidelines for Residential developments	- Develop policies to make provision for efficient and effective transit services for residential development in planning stages	In-house		1982	N/A	- In-house (completed and approved)

Prepared by: Hamilton Street Railway

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (DETAILED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
SR/CCI.	Operational/Management/ Physical Plant Review	Comprehensive Study of the Services, People and Resources within the Public Transit System	I.B.I.	Sept. 1982	Sept. 1983	$200,000.	

Prepared by: OC Transpo

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates Start	Finish	Est. Cost	Remarks
OC Transpo	Test No. 2 Diesel Fuel	Test economy, environmental acceptability and long term engine maintenance change through substitution of No. 2 for No. 1 diesel fuel.	OC Transpo	1980	Ongoing	N.A.	
OC Transpo	Radial Tire Tests	Test cost effectiveness of radials in transit service.	OC Transpo Michelin	1983	-	N.A.	
OC Transpo and M.T.C.	Articulated Bus Demonstration Project	Evaluation/Feasibility including recording & reporting all maint. on the 21 artic. buses during the 3 yr test.	OC Transpo	1982	1985	Component of M.T.C. Demonstration	Honour Fare and Artic. Bus Projects are being carried out concurrently.
OC Transpo and M.T.C.	Honour Fare Demonstration Programme	Demonstration of concept for evaluation of system application.	DELCAN	1981	1983	$144,000	

Prepared by: OC Transpo

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
OC Transpo	Automated Curtain Signs	To develop a mechanism to automatically and simultaneously change front, side and rear route indicator information using microprocessor based technology.					
		- Development	Summis Corp and Isaacs Assoc.	1981	1982	$10,000	Prototypes fro two suppliers have been test
		- Testing and Implementation	OC Transpo	1983	-	$30,000	Full Implement ation Project
OC Transpo M.T.C. CREDA	Bus Propane Engine Demonstration	Install and operate propane fueled engines in 20 buses to determine feasibility and safety of complete fleet conversion.	OC Transpo	1983	1985	Approx. $1,000,000	
OC Transpo M.T.C.	Automated Passenger Counting	To modify existing system software and acquisition of 11 additional counting units to accommodate articulated buses. Purpose to utilize automated passenger counting system evaluate both [illegible] and Hanover [illegible]	Isaacs Assoc. & Group Five Cons.	1982	1982		These developme are integrated within the Artic. Bus Demonstration Project

Prepared by: OC Transpo

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
OC Transpo	Customer Contact System	To create record of, and management reports from, customer contact - by type, time & location.	In-House (PR&Mark, Planning, MIS)	Nov. 80 (manual)	Nov. 82 (Auto.)	$30,000 staff time	
OC Transpo	560 Displays in Traffic Generators (using 560 data)	To provide passengers with visual schedule info. at high traffic locations via remote video terminals using Teledon technology.	Genesys Group & Teleride Developments	July 82	Nov 82	$25,000	
OC Transpo	Bus Stop Printed Schedules (using 560 data)	To develop the capability of generating stop-specific schedule info. for posting at bus stops.	Teleride Developments	July 82	Jan 83	$19,000	
OC Transpo	Paratranspo Despatching & Data Collection System	To develop first phase of computerized scheduling and despatching system	C.S.G.	1982	early 83	$85,000	

'repared by: OC Transpo

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
OC Transpo & RMOC Transp. Dept.	Information & Guidance Systems	To develop design guidelines for Information and Guidance Systems for all OC Transpo & Transitway needs	DELCAN	Jan 81	Aug 82 (completed)	$65,000	RMOC funded under Transitway Programme
OC Transpo & RMOC Transp. Dept.	Transitway Station Design	To develop a scheme for station design and graphics to meet transportation and information needs in transitway stations	Alison Hymas Design Assoc.	Sept.82	Nov 82	$7,000	RMOC funded
OC Transpo	Bus Stop Information System	To co-ordinate, control and facilitate update of bus stop related info: location, routes served, 560 numbers, posted maps, etc.	In House (Planning, Equipment, MIS)	Dec.81 (manual)	March83 (auto)	in house	
OC Transpo	Corporate Objectives - Measurement	To develop standard methods for measurement of service performance as related to corp. objectives.	In House (but will need consultant advice)	Apr 82	Jan 84	in house	

Prepared by: OC Transpo

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
OC Transpo	Automatic Vehicle Location & Control	To develop and install a universal transit microprocessor and compansion systems	Teleride	1982	1985	$1,000,000	
	Automatic Telephone information system	To automate manual information services	Teleride	1982	1984	$800,000	
	Communications, Operator and Bus Assignment	To manage and control service via comprehensive radio communications	Teleride	1981	1983	$521,000	Components of overall joint TICCS programme between M.T.C. OC Transpo Hamilton & Mississauga
	Inventory Control	To develop a computerized system	SAGE	1982	1983	$250,000	
	Vehicle Maintenance	To develop a comprehensive computerized system	SAGE	1982	1984	$384,000	
	Financial Systems	To develop a comprehensive computerized system of reporting and monitoring programmes	SAGE	1982	1984	$748,000	
	Timekeeping and Operator Bidding	To develop a computerized	SAGE	1982	1983	$374,000	

Prepared by:

Transport & Vehicle Systems
Transportation Technology & Energy
Ministry of Transportation &
Communications of Ontario

URBAN TRANSIT RESEARCH & DEVELOPMENT

PROJECTS UNDERWAY AND/OR NEEDED (PLANNED)

Agency: (Fed., Prov., Industry, Univ., etc.)	Project Title	Status		Consultant Contractor	Project Manager	Dates		Est. Cost	Remarks
		Underway	Needed			Start	Finish		
MTC TTC UTDC	CLRV Noise & Vibration	x		MTC UTDC	TTC		1982	$33 K	Reduce noise and vibration problems associated with CLRV
MTC TTC DOFASCO	Subway Truck Improvements	X		MTC DOFASCO	TTC		1982	$37 K	
MTC TTC	Ring Damped Wheels	X		TTC MTC	TTC		1982	$22 K	
MTC	Wheelchair Restraint System	X		Queen's University	MTC		1982	$11 K	
MTC	Articulated Trolley Bus	X	X	MTC	MTC	1982		-	Market survey
MTC	Propane Powered Bus	X		MTC	MTC	1982		-	Technology Under Investigation
MTC	Community Based Commuter Transit	X		MTC	MTC		1982	$34 K	Concept definition and assessment of applicat
MTC	Rotary Powered Steerable Trucks	X		U.T.D.C.		79/12/31	82/10/31	$3.5M	For Rail Transit Applications
MTC	Articulated Light Rail Vehicle Development	X		U.T.D.C.		80/1 /1	82/9/30	$4.1M	Shared Funding MTC/UTDC

Prepared by: Ontario Ministry of
Transportation & Communications

Transit Office.

URBAN TRANSIT RESEARCH & DEVELOPMENT

PROJECTS UNDERWAY AND/OR NEEDED (PLANNED)

Agency: (Fed., Prov., Industry, Univ., etc.)	Project Title	Status		Consultant Contractor	Project Manager	Dates		Est. Cost	Remarks
		Underway	Needed			Start	Finish		
Ont. - TTC	Passenger Counter Improvements	x		Group 5	M. Prentupa TTC D. Bonner MTC	Sept./80	Aug/82		Attempt to improve accuracy of TTC passenger counters
Ont-Kitchener/ Waterloo/Guelph Brantford	Taleridar 200 Shared Facilities	x		Teleride Corp.	R. Clark, Teleride D. Bonner, MTC	Sept./81	Aug./84		To evaluate the effectiveness and economics of shared facilities in nearby communities
Ont.- Mississauga/OC Transpo TTC/Hamilton	Articulated Bus (General Motors)	x		N/A	D. Bonner	1979	1985		Evaluate effectiveness in operations and economies of articulated buses
Ont.-OC Transp	Honour Fare on Surface Bus System	x		DelCan	D. Turvey, DelCan D. Bonner, MTC	Nov./82	Oct./83	165,000	To evaluate operations and economic impact and public acceptance/ reaction and
Ont.-TTC	Computer Aided Scheduling for Physically Disabled Service - Wheel-Trans	x		Not Selected		July/82	Nov./83		automate order taking and reservations syste
Ont.-TTC	Rules of the Road Media Campaign	x		TTC	A. Gallo	Sept./81	Dec./81		To convince motorists to give way to buses entering traffic

Prepared by: Ontario Ministry of Transportation & Communications

Transit Office

URBAN TRANSIT RESEARCH & DEVELOPMENT

PROJECTS UNDERWAY AND/OR NEEDED (PLANNED)

Agency: (Fed.,Prov., Industry, Univ., etc.)	Project Title	Status		Consultant Contractor	Project Manager	Dates		Est. Cost	Remarks
		Underway	Needed			Start	Finish		
Mt.-TTC	Rules of the Road Priority Transit Signals	x		N/A	R. Topp D. Bonner	Sept./81	Apr./83		To evaluate the impact on bus and auto of installing priority traffic signals at bus only roadways.
	New Bus Engines		x						Off-Oil-New Fuels
	Non-Conventional Fare Systems		x						Passen vs. Economics vs convenience - credit c charging
	Micro-Computer applications, Studies		x						Computerized applicati for transit
	Marketing Effectiveness		X						Intensity and media choice for marketing (advertising)

Prepared by: Canadian Institute of Guided Ground Transport

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
TDC	Homopolar Linear SYNCHRONOUS MOTOR	Design, analyze, test new motor class	CIGGT	July /82	Dec / 84	140,000	
UTDC	VVFF LIM	Test motor parameter	CIGGT	May/81	June/82	12,000	

Prepared by: SEL CANADA

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
UTDC	Intermediate Capacity Transit System	Automation	SELC				
ITT	Transponder Systems	Long Haul Railroad Capacity Improvements	SELC	2/82	12/84	$600 K	Internal Corporate Financing
ITT	Advanced Train Detection System		SELC	1/83	12/84	$200 K	-

Prepared by:
Ontario Bus Industries

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		Est. Cost	Remarks
				Start	Finish		
Ontario Bus Industries	Small business	Develope a small heavy duty low floor front wheel drive transit bus with high degree of accessibility	O.B.I.	Jan.82	Dec. 84	1.8 million	Prototype scheduled for March 1983

Prepared by: TELERIDE

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (OCTOBER)

Funding Agency	Project Title	Objective	Contractor	Status Start	Dates Finish	Est. Cost	Remarks
MTC	Automatic Vehicle Location & Control	Improve schedule adherence, dynamic scheduling, response to problems and operational control.	Teleride	1981	1984	2,000,000	
MTC	Automatic & Semi Automatic Public Information Systems	Further develop Teleride Public Information Systems and aids to transit information operations	Teleride	1981	1984	900,000	
MTC	Communications Operation & Bus Control Programs	Develop centralized programs for controlling transit telephone and radio communications vehicle and operation assignments	Teleride	1981	1983	300,000	

Prepared by: Urban Transportation Development Corporation

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (UNIDO)

Agency	Project Title	Objective	Contractor	Status - Dates Start	Finish	Est. Cost	Remarks
Ministry of Energy	Hydrogen	Develop a vehicle to run on liquid Hydrogen	UTDC	1981	1983	7,000K	
Ministry of Transportation and Communications	ALRV	Develop & Test an Articulated Light Rail Vehicle	UTDC	1979	1982	4100K	
Ministry of Transportation and Communications	Steerable Trucks	Develop two unique sets of steerable trucks for passenger transit	UTDC	1980	1982	3500K	
Transport Canada	Flywheel	To develop a flywheel energy system for a bus	UTDC	1978	1982	1400K	
Washington Metropolitan Area Transit Authority	WMATA	Develop modifications to trucks to reduce wheel & track wear	UTDC	1982	1983	310K	
Ontario Northlands Railway	Frame Bracing	Develop a frame braced freight truck	UTDC	1982	1984	200K	

Prepared by: TTC

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		($000's) Est. Cost	Remarks
				Start	Finish		
TTC	Communications and Information System (CIS)	Real time monitoring and control of surface fleet.		1972	1983	5,225	A4 Now in phase of developmer
	Computerized train dispatch and information system (CTDIS)	Computerize departure control of subway trains and document run information for transit control		1978	1982	600	A4
	Magnetically encoded ticket system (MET)	Testing of MET equipment to determine suitability for TTC	Not yet Determined	1981	1984	1,100	
	Articulated buses	Operational and equipment demonstration to determine suitability for TTC use		Fall 1982	1985	3,240	A1 Costs shown are vehicle costs
	EZ Data	Electronic hand held data storage by field checkers	ATE Management (source)	1983	1984	240	C1 Not yet approved
	Mini scheduler	To improve automated scheduling and report preparation		1981	1982	30	C1

Prepared by: TTC

URBAN TRANSIT RESEARCH AND DEVELOPMENT IN CANADA

PROJECTS UNDERWAY AND/OR PLANNED (NEEDED)

Agency	Project Title	Objective	Contractor	Status - Dates		(000's) Est. Cost	Remarks
				Start	Finish		
TTC	Rules of the Road Campaign	To determine whether an advertising campaign would result in auto drivers giving bus drivers priority exiting from bus bays	Environics Research	1981	1982	250	B3

TDC Projects (1980 - 1982)

TECHNOLOGY DEVELOPMENT

Bus and Paratransit Vehicle Technology

1. Microprocessor-Controlled Bus Destination Sign

   This project demonstrated the concept of an economical microprocessor-controlled destination sign, with flexibility and memory capacity, that may help transit operators in large urban centres reduce capital and operating costs by reducing the number of reserve bus pools. A model sign was developed and constructed in a format acceptable to the Ottawa-Carleton Regional Transit Commission.

2. Evaluation of Propane Fueled Vehicles

   This project, sponsored by the Energy R&D panel (ER&D), is studying the technical, operational and economic aspects of propane fueled engines in automobiles, small commercial vehicles and commuter vans. A test program will include a one year demonstration of vehicles in various Canadian locations. Propane fueled engines have the potential of reducing the dependence of para-transit operations on petroleum-based energy.

3. Feasibility of Disc Engine

   This project, funded by ER&D, will develop a direct injection stratified charge (DISC) modification package applicable to the Ford 300 6-cylinder engine currently installed in the Econoline van. A performance and cost/benefit review of converting to disc engines as a fuel saving measure will be undertaken.

4. Non-Petroleum Urban Transit

   This study, funded by ER&D, investigates the availability of alternative technologies and outlines their characteristics in terms of vehicle types, motive power systems and infrastructure requirements. The feasibility of converting public transit systems to non-petroleum energy sources, using available alternative technologies, is analyzed. Technologies are ranked in terms of suitability for Canadian conditions and priorities for development.

5/6. Battery R&D in Canada/Lower Cost Nickel-Zinc Batteries

   This project identified and evaluated electric battery R&D efforts in Canada. Recommendations were formulated regarding the need for, and possible benefits of, greater government support of battery R&D. The objective of the research is to replace a portion of petroleum-based energy used in urban transportation with electric energy. With the same objective, work on nickel-zinc batteries, partially funded through ER&D, is now in progress.

7/8. Diesel/Flywheel Hybrid Development and Flywheel Trolley Bus

This project, in collaboration with ER&D, designed and constructed a high speed rotating flywheel. This becomes a practical energy storage device, storing vehicle braking energy to supply energy for peak power drains during acceleration. The flywheel has potential for reducing engine size and providing improved energy efficiency in transit buses. The system was tested at the Urban Transportation Development Corporation's Kingston facilities.

Work is about to begin on the application of flywheel technology to the trolley bus. The objective is to give the trolley bus increased flexibility by allowing it to operate off the wires for certain distances.

9. Transit Vehicle for the Disabled

The objective of this project, in collaboration with the Canadian Urban Transit Association (CUTA) is to improve urban access for the disabled through the development of requirements, specifications and tender document for a more appropriate urban vehicle than is presently available. The first two project phases, definition of requirements and market assessment, have been completed. Based on recommendations of the review committee, work will begin on the final phase, to prepare detailed vehicle specifications and a tender document.

Bus and Paratransit Operational Technology

10. G.S.M. Paratransit Vehicle Tests

The purpose of this project was to test the innovative GSM prototype vehicle in terms of fuel consumption, operational characteristics, integrity of structure and safety. User acceptability, ease of access/egress and driver/passenger reactions were evaluated. Passengers include wheelchair users, other disabled persons and the elderly. A final report is in preparation.

11. Algorithms for the Scheduling and Routing of Vehicles for Transportation of the Handicapped

This current project will develop a computer-aided scheduling and routing system for use in paratransit vehicles to transport the disabled. The first application and evaluation of the system is expected to be used in the scheduling and routing of subscription riders in a major paratransit service.

12. SSTOP Program Enhancements

This project undertook further development of traffic signal systems through enhancements to the SSTOP (Off-Line Signal System Optimization Package) program. The emphasis of the work was on urban transportation energy savings.

New Systems and Automation

13. Intermediate Capacity Transit System (ICTS) Lightweight Bogie

The objective of this project, cost shared by TDC, Province of Quebec and Bombardier, is to design, construct and test two prototype motorized bogies, based on the motorized bogie concept previously identified by Bombardier on behalf of TDC. The new bogie will be smaller, simpler to fabricate, lighter and less costly to install than the conventional system. The new system is expected to improve intermediate capacity transit systems.

Safety and Product Qualification

14. Paratransit Vehicle Technology: Guidelines for Regulators, Operators and Vehicle Developers

This project prepared a handbook of paratransit vehicle technology guidelines, based on an assessment of currently available paratransit vehicles, relevant legislation, user and operator requirements. These guidelines will provide a framework within which regulators, operators and vehicle developers can initiate new technologies and services. The "guidelines" will be distributed by the Roads and Transportation Association of Canada.

TRANSPORTATION PLANNING & MANAGEMENT

Special Planning Studies

15. Factors Influencing Modal Choice

This project is to determine the values and motivations which influence our choice in transport. The result of this project will serve as the basis for a publicity and public awareness campaign on the advantages of transit transport for individuals and society.

16. New Concepts in Shared Vehicle Fleets

With the objective of urban transportation energy conservation, the implementation of a wide range of complementary incentive/disincentive measures has potential for achieving shifts to public transit and reducing overall travel demands. A new variation is the concept of shared vehicle fleets. The improved matching of vehicle attributes to household travel needs will result in improved efficiency of transportation operations. A research, development and demonstration program will be developed by TDC, sponsored by Research Planning & Coordination, Energy Program.

OTHER TYPES OF R&D PROJECTS

17. Urban Transportation Energy Management

This project, cost shared with ER&D, will develop a conceptual framework for urban transportation energy management (UTEM) based on the identification and assessment of existing and potential energy management measures and on urban transportation systems characteristics, both passenger and goods. Within the framework, appropriate UTEM programs for various sized cities will be developed.

National Research Council of Canada

Urban Transit Related Projects 1981/82

Project Description	$ 1981/82 Incl. personnel costs.	$ total (est.)	Funding Source
Computer controlled traffic light sequencing strategies.	65,000	230,000	Federal/Muncipal
Performance analysis of a car and a bus utilizing hybrid power systems.	114,000	675,000 (to 83/84)	Federal
Structural tests on subway car body and ride measurements.	N/A	N/A	Industrial
Transit vehicle passenger counter development.	30,000	80,000	Federal

Transport Canada / Transports Canada

Surface / Surface

Your file / Votre référence

Our file / Notre référence

S-3201-2

August 26, 1982

A. Cormier
Executive Director
Canadian Urban Transit Association
234 Eglington Avenue East
Suite 301
Toronto, Ontario
M4P 1K5

Dear Al,

Subject: Urban Transit Research and Development Coordination

Further to your request to TDC for information on the above subject, you have now been supplied wth the relevant information by Barbara Smith. Barbara has asked me to give you similar information on R&D projects in my area. These projects, with which you are familiar, are as follows:

1. "A Review of Urban Transportation Services for Disabled Persons" - a study being carried out by Hickling Partners Inc.

   Total Cost: $23,400
   Completion Date: End August, 1982

2. "Development of a Training Program for Personnel in Urban Transit Industry in Canada" - A joint Federal/Provincial and CUTA study, being carried out by IBI Group and P.G.B. Associates.

   Total Cost: $200,000
   Federal Contribution: $54,500
   Completion Date: End June, 1983

3. "Travel To Work Survey" - an annual survey jointly funded by Transport Canada and EMR and carried out since 1973 by Statistics Canada during the month of November. Results of this survey are made available to CUTA and all its members.

   Estimated Cost for 1982 Survey: $95,000

4. "Analysis of Travel to Work Survey Data" - A study carried out internally within Surface Policy Branch. Report of this work will be made available to CUTA in the near future.

Estimated Cost: $5,000

As I indicated to you before, the other areas of R&D work we have discussed in the past will be reviewed once we have the Cabinet Decision on the Future Federal Role in Urban Transportation.

I hope you will find this information useful and if you have any questions please call me at 613-996-4180.

Yours sincerely

Arjan Chandan
Chief
Policy and Analysis

c.c. Barbara A. Smith
TDC - Montreal